DOCUMENT RESUME

ED 474 550 IR 021 680

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TITLE	Time for Technology: Successfully Integrating Technology in Elementary School Classrooms.
PUB DATE	2002-04-30
NOTE	68p.; Master's Thesis, Aquinas College.
PUB TYPE	Dissertations/Theses - Masters Theses (042) -- Reports - Research (143) -- Tests/Questionnaires (160)
EDRS PRICE	EDRS Price MF01/PC03 Plus Postage.
DESCRIPTORS	Curriculum Development; *Educational Technology; Elementary Education; Elementary School Students; *Faculty Development; Questionnaires; Teacher Surveys; *Technology Integration; *Technology Uses in Education

ABSTRACT

This study, conducted in March 2001, surveyed 142 grades 2-4 classroom teachers regarding their use of educational technology. The purpose of the study was to demonstrate the importance of providing teachers with the necessary time to investigate, implement, and fully integrate technology into their classrooms. While it is imperative that schools work to provide adequate hardware, software, training, and support, it was the hypothesis of this study that, in order to fully capitalize on schools' technology investments, administrators must find creative ways to provide teachers with preparation and development time dedicated toward integrating this technology into their classroom curriculums. While additional research needs to be conducted, a strong correlation was found between the amount of time teachers spent working with computers and the level of technology integration in their classrooms. Copies of the letter to school administrators, cover letter sent with survey packets, survey instructions, and survey are appended. (Contains 45 references.) (Author/MES)

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ED 474 550

Time for Technology: Successfully Integrating Technology in Elementary School Classrooms

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Masters in the Art of Teaching Program

Submitted in partial fulfillment
of the requirements of the
Masters in the Art of Teaching
Aquinas College
School of Education

April 30, 2002

IR021680

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ABSTRACT

This study, conducted in March 2001, surveyed 142 grade 2-4 classroom teachers regarding their use of educational technology. The purpose of the study was to demonstrate the importance of providing teachers with the necessary time to investigate, implement and fully integrate technology into their classrooms. While it is imperative that schools work to provide adequate hardware, software, training and support, it was the hypothesis of this study that in order to fully capitalize on schools' technology investments, administrators must find creative ways to provide teachers with preparation and development time dedicated toward integrating this technology into their classroom curriculums. While additional research needs to be conducted, a strong correlation was found between the amount of time teachers spent working with computers and the level of technology integration in their classrooms.

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CHAPTER ONE

INTRODUCTION

Problem Statement

Educators and administrators have been struggling to effectively integrate technology into the classroom for over twenty years. In 1981, as I was completing my under-graduate degree and elementary education certification, the first IBM PC was released. Within a year, over three million personal computers had been sold, and by 1996 more than 250 million were in use (Shelly, Cashman, Gunter, & Gunter, 1999). By 1998, ninety percent of all schools not only had computers, but also had access to the Internet (National Science Foundation, 2000). Indeed, computer technology made an explosive entrance into today's society, including our schools, but even now, twenty years later, the majority of the school systems have failed to fully utilize this technology.

A 1998 survey found that while students, teachers, and parents agree that computers have the potential to make substantial improvements in education, they have not been fully integrated into the learning process (Schroeder, 1999). Thirty percent of grade 4-12 teachers still do not use computers or use them only for administrative tasks (Becker, 1999).

Researchers have identified many reasons why technology has not been better integrated into our classrooms: unavailability or inaccessibility of hardware, lack of

quality software, inadequate staff development, the absence of models for success, insufficient technical and institutional support, and teachers' anxiety or resistance to technology. Over the years, school systems have worked hard to do a better job of addressing these various issues, but they still have not seen substantial advancements in the use of technology in the classroom (Morrison & Lowther, 2002; Fisher & Dove, 1999; Rogers, 1999; Becker, 1998; Cummings, 1998; Quality Education Data, 1995; Barnett & Nichols, 1994; Appalachia, 1991).

The hypothesis for this project is that a "lack of time" is the single most important factor that is keeping teachers from fully integrating technology into their classrooms. Even schools that have adequate hardware and software, clear technology plans, focused staff development opportunities, and administrative and technical support, are not utilizing this technology to its full potential (Anderson, 2000; Becker, 1994).

A good teacher keeps busy all day and often into the evening working with students, grading papers, and preparing for the next day's classes. Teachers need extra time to develop and prepare integrated lessons, to review, test, and customize programs, to apply the material presented at in-services or training classes, to investigate Internet resources, to share ideas with other educators, and to trouble-shoot technology problems within their classrooms.

It is the purpose of this study to investigate the relationship between classroom teachers' investment of time and the successful application of technology in the classroom. This project will explore the theory that the teachers who have significantly integrated technology into their curriculums are those teachers who have made this investment of time.

The findings of this study should be of great importance to school administrators and classroom teachers, as well as the general public. If we expect and want to ensure that technology is extending and enriching our children's education, creative ways must be found to provide additional time for teachers to reach this goal. Even schools with limited funding, who are unable to afford state-of-the art technology, should be able to better maximize existing hardware and software by looking for innovative ways to provide teachers with more time to to develop and prepare integrated lessons.

We have spent millions of dollars on educational technology, but have yet to see much of a return on this investment (Schroeder, 1999). Through the findings of this study, educators will see that a concerted effort to provide teachers additional time could reap significant benefits in terms of increased technology integration.

The next chapter presents a review of related literature focusing on the factors contributing to the effective integration of technology in traditional elementary school classrooms.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Research studies have been conducted on the use of computers in education since the time computers were first introduced into the classroom -- before user-friendly software had been developed, before the hardware was compatible, and before teachers had received even minimal training on basic computer operations. Questionable results, stories of wasted money, and reports of failed programs abounded (Coburn, Kelman, Roberts, Snyder, Watt, & Weiner, 1982).

Over the years, as educators and administrators struggled to better understand the role of technology in today's schools, many additional research studies have been conducted. This review of related literature focuses on those studies and journal articles written within the past five to ten years.

Related literature has identified a number of common concerns with regard to the successful integration of technology in the classroom: (a) justifying the use of technology by demonstrating improved academic test scores; (b) basing technology programs on curriculum-centered goals; (c) examining the effect of teacher anxiety and attitudes; (d) identifying and reducing barriers such as inadequate hardware, software and technical support resources; (e) highlighting

the need for appropriate staff development training; and (f) recognizing the need for teacher development time. Each of these issues will now be explored.

Demonstrating Academic Results

Most of the early technology studies conducted did not profess to have scientific proof of the positive influence of technology on student learning.

> [There was no] hard evidence that their students' computer use resulted in higher test scores or greater intellectual competence. Instead, our attribution of the exemplary teaching practice label was based on the assumption that important academic outcomes will result from systematic and frequent use of computer software for activities that involve higher order thinking such as interpreting data, reasoning, writing, solving real-world problems, and conducting scientific investigation (Becker, 1994, p. 316).

In recent years, however, researchers have succeeded in demonstrating a correlation between technology and improved student test scores. Middleton (1998) and Wenglinsky (1998) both found that in classrooms where teachers appropriately integrated technology to augment their teaching, students had significantly better standardized test scores. Just using computers for drill and practice was not sufficient, they pointed out, to produce these results; technology should be integrated as a problem-solving tool in ways that encourage higher-level thinking.

Mann and Shafter (1997) conducted a six-month survey of more than 4,000 teachers in New York, then reviewed student achievement tests to

determine the effects of increased technology. Based on standardized test scores, they claimed that technology did indeed have a positive effect on student learning. They found that schools with "more instructional technology and teacher training," saw a 7.5 percent average increase in the number of high school students who took and passed the state college-prep math exam, and saw an 8.8 percent increase in college-prep English exam results. They also found a strong relationship between increased technology and higher scores on state sixth grade math test scores. Mann and Shafer acknowledged, however, that they cannot *conclusively* say that increased technology use was what caused the higher test scores because this kind of scientific study would require withholding technology from some schools, which, in today's society, would be an unacceptable situation.

Curriculum-Centered Technology Goals

It is important for educators and administrators to look at technology not as a stand-alone subject area, but as a tool to support and supplement other curriculum areas. Instructional concerns, not management or technical concerns, should influence technology plans and purchases. Technology needs to be integrated as a tool so that curriculum and student needs drive technology, not the reverse (Dockstader, 1999; Harvey, 1998; Wolosoff, 1998; Mann, 1997; Harvey & Purnell, 1995).

Moersch (1995) asserted that the aim of technology integration is to find authentic ways to use technology, for concept/process-based instruction, higher-level thinking, and qualitative assessment. Computer technology, he said, should

be seen as a tool that supports and extends student understanding, providing a means to authentic, hands-on inquiry related to a problem, issue or theme.

In an article titled "Running to Catch a Moving Train: Schools and Information Technologies," Becker (1998) stressed the need for *informed* decision making and improved planning. Current technology solutions, he asserted, do not match with existing curriculums and/or delivery methods. He noted that hardware and software acquisition frequently occurred without an educational plan or sound technological advice.

Most of these recent studies on technology in the classroom appropriately emphasize the need to place *learning* ahead of *technology acquisition* in technology planning. In 1999, Rogers asserted that "technology plans that center on technology rather than on teaching and learning create more barriers than they prevent" (p. 17). The simple acquisition of computer hardware and software does not guarantee the appropriate application of that technology in the classroom, technology plans must remain focused on academic or curriculum-centered goals.

Teacher Anxiety & Attitudes

Numerous studies highlight the correlation between "teacher attitude" and the successful integration of technology (Becker, 1999; Ertmer, 1999; Galowich, 1999; Rogers, 1999; Cummings, 1998; Durham & Ross, 1995; Harvey & Purnell, 1995; Larner & Timberlake, 1995; Quality Education Data, 1995). Teachers with positive attitudes toward computers have been shown to demonstrate more successful integration of technology, while teachers with negative attitudes do not.

Like the chicken and the egg, it has been debated whether teachers' prejudiced opinions affect their use of technology, or whether their attitudes simply reflect their positive or negative experiences with technology. While success has been found to be strongly related to teachers' enthusiasm, initiative, and sense of improvement, it has been demonstrated that teacher's interest and enthusiasm for technology was highest when schools had enough hardware, appropriate software and provided relevant training (Mann & Shafer, 1997).

In 1995, Harvey and Purnell predicted that, over time, teacher attitudes would shift due to the attrition of teachers who did not grow up in this computer era. In the coming years "teacher attitude," they predicted, would become less negative simply because teachers will be more accustomed to technology.

Matthews (1998) found that newly hired teachers were found to be more likely to use technology than veteran teachers. Because most veteran teachers did not have as much exposure to computers as recent college graduates, they required more support and training. Matthews proposed that, as time passes, the need for both veteran and new-hire teachers to receive basic computer training will diminish.

Barriers to Integration

There are many factors considered to be critical to the success of technology integration, or thought to be the cause for the failure of a technology program. As with the varied perspective of a glass half full or a glass half empty, these factors may be seen as barriers that prevent successful integration of technology or as critical success factors.

Quality Education Data and Malarkey-Taylor Associates (1995) surveyed over one thousand K-12 teachers, administrators, media specialists, and technology coordinators, and found a common set of factors identified as barriers against greater usage of computers. Over 55% of those surveyed noted a lack of training or workshops, a lack of time to learn how to use the systems, a lack of knowledge or general understanding about services available, a lack of access to equipment, and a lack of phone, cable or data lines in the classroom.

In surveying 5862 teachers in 55 Idaho school districts, Matthews (1998) found that, based on the 3500 responses, a high correlation could be seen between the number of computers in the classroom and the teachers' actual use of that technology. Although one-third to one-half of the teachers never actually used technology for any instructional purposes, of those who did, he found that the higher the number of computers in the classroom, the more frequently they were used.

Voicing the frustrations of many classroom teachers today, Fisher and Dove (1999) presented the topic "Muffled Voices: Teachers' Concerns Regarding Technology Change" at the 1999 Society for Information Technology & Teacher Education International Conference. In this report, they identified a number of obstacles that teachers felt were hindering the integration of technology in the classroom. The most concrete example was that teachers were frustrated by the simple lack of space; rooms that were already overcrowded with students, desks, and supplies now had to make room for computer workstations. They also felt hindered by a lack of administrative support and the absence of procedures for

acquiring and repairing equipment. Finally, and most significantly, teachers found it difficult to integrate technology into their classrooms due to a lack of technology training and a lack of time to prepare computer-based lessons.

Rogers (1999) identified the following barriers to adopting technology in education: lack of funding, inadequate staff development, insufficient time in the day, poor availability and accessibility of equipment, lack of technical and institutional support, and poor quality of services and materials.

Rogers noted, however, that "as teachers become more comfortable with technology, their focus on barriers decreases" (p. 13). Advanced computer users could find ways to work around problems when they occurred, or could find ways to get by with the limited resources available. They were much less likely to be frustrated and give up when technology situations were less than ideal. Novice users, however, did not have the skills or confidence to overcome these barriers. Especially when schools are just getting started or when they are working to strengthen their technology programs, Rogers recommended that they pay close attention to identifying and reducing these barriers.

Rogers pointed out that these barriers suggest a circular motion. She noted that they are all interdependent, "like a three-legged stool". If anyone of the barriers to technology integration was present, the program could not succeed. For example, even if a school had an adequate number of functioning computer systems, without the software to run on them, or the staff training to know how to use them, the computers sit idle. The expenditures on technology, though well-

intentioned, were a waste of money and time. *All* of the critical factors must be addressed in order for a technology program to fully succeed.

Bailey and Pownell in 1998, painted educators a clear picture of the importance of these critical success factors by comparing them to the basic physical needs in Maslow's Hierarchy of Needs. Bailey and Pownell identified six basic technology "physiological needs" which must be satisfied before higher-level needs, such as the continuous and innovation application of technology, could be achieved.

The first basic need they identified was ***time***, time to learn new skills, time to think, time to practice, coach, and collect feedback. A second "physiological need" was a detailed ***technology plan*** that provides direction, vision, and projected outcomes. Third was a solid, well-planned ***staff development*** program. Next were fundamental ***hardware***, ***software*** and ***Internet access*** resources for classroom teachers to be able to integrate technology into their curriculums. The fifth need identified was a ***technology-facilitating infrastructure***, meaning the physical availability of computer equipment and the administrative support necessary for the program to succeed. And, lastly, effective ***technical support*** that was readily available to provide problem-solving and educational support (Bailey & Pownell, 1998).

A final barrier to technology integration identified in recent literature was the lack of financial support. Adequate funding is necessary for on-going hardware purchases, acquisition of appropriate software, technical support, staff development training, and time for teachers to create materials and lessons using

this new technology (Becker, 1999; Rogers, 1999; Harvey & Purnell, 1995; Larner & Timberlake, 1995; Quality Education Data, 1995; Becker, 1994; Appalachia, 1991). Adequate planning for and creative solutions to funding needs should always be part of a solid technology plan.

Staff Development Training

Appropriate and timely staff development training is another focus of many journal articles and research projects (Bailey, 2000; Clifford, 2000; McCannon & Crews, 2000; Becker, 1999; Fisher & Dove, 1999; Rogers, 1999; Schmidt & Sasser, 1999; Anderson, 1998; Mann & Shafer, 1997; Harvey & Purnell, 1995; Larner & Timberlake, 1995; Quality Education Data, 1995; Barnett & Nichols, 1994; Becker, 1994; Appalachia, 1991).

Unfortunately, most schools do not allocate adequate funds for staff development training. While the private sector claims to spend 30 percent of technology budgets on training, schools typically spend 10 percent or less (Mann & Shafer, 1997).

Following a 1998 survey of over 2,000 grade 4-12 teachers nationwide, Becker (1999) reported that there is a positive correlation between staff development, teacher attitude, and the increased professional and student use of the Internet.

> The new understandings required of teachers include not only technical skills but an understanding of the relevance of the various features and information provided by the software to their own instructional and curricular priorities, as well as, pedagogical strategies of using the

software in the context of other constraints, such as time limitations and prerequisite student skills (p. 17).

Even when technology staff development was offered, however, there were many reasons why teachers did not always take advantage of the training. McCannon and Crews (2000), in surveying over 170 K-5 teachers, identified six reasons why teachers have not participated in training offered to them: (a) too busy; (b) too far to travel after school; (c) release time was not provided during the school day; (d) no stipends were offered; (e) heavy traffic; and (f) someone else was already providing individual help.

It is important to note that technology training is not a one-time effort. One or two computer courses will not be enough to prepare teachers to integrate technology into their classrooms. It is estimated that it takes three to five years with at least eighty hours of training for teachers to be able to move into more advanced levels of technology integration (Anderson, 1998; Becker, 1994).

Barnett and Nichols (1994) presented two creative approaches to staff development. The first was to hire an all day "rover sub" who filled in for a series of teachers as they received individual computer training an hour at a time. This training could have been provided by an in-house technology staff person or by an outside trainer. Using this method, five or six teachers could receive personal, customized instruction in one day's time. The second suggestion was the "mini-grant concept". Mini-grants offered an incentive of release time, equipment software, or even a stipend to develop technology lessons for their classrooms.

Because funding is usually limited, the grant process can help ensure both accountability and maximization of technology funds.

Time

Even more than additional training, teachers have expressed a need for time to plan lessons that integrate computer activities into their lessons (Smith-Gratto & Fisher, 1999). It was found that most schools were not providing time for teachers to develop these curriculum lessons. "Most teachers reported spending almost three times as much of their own time learning about computer-related technology as they spent in district-sponsored training" (Mann & Shafer, 1997, p. 23).

While appropriate and timely staff development is essential, it is still not enough. Although not the main focus of the educational research studies, "lack of time" is cited in numerous reports as a barrier to technology use (Fisher & Dove, 1999; Rogers, 1999; Schmidt, Sasser, Lindurka, Murphy & Grether, 1999; Smith-Gratto & Fisher, 1999; Weikart & Marrapodi, 1999; Matthews, 1998; Mann & Shafer, 1997; Harvey & Purnell, 1995; Office of Technology Assessment, 1995; Barnett & Nichols, 1994).

> Lack of time to develop new courseware, new skills, or advanced applications becomes a barrier at an individual level and at an institutional level. Personal time needed to build skills or create new teaching materials is considerable, particularly for teachers just learning to use technologies. [Lack of time as a barrier] is often related to a need for release time for courseware and staff development. If release time is not

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> available, and if personal time is too fragmented or limited, teachers cannot learn new skills and develop new materials (Rogers, 1999, p. 9).

Teachers must have time to synthesis the information and time to develop lessons that can be used in their classroom (Quality Education Data, 1995; Appalachia, 1991).

> The staff development process should include a time of practice after the training has been completed and before the new technology is introduced to students. Teachers need time to try the new products, discover any pitfalls and create strategies to overcome anticipated problems (Clifford, 2000, p. 35).

Harvey and Purnell (1995) reported that "participants repeatedly named time as the most common barrier to change. The education system as currently structured does not pretend to make available to teachers the amount and kind of time needed to develop professionally" (p. 9). Teachers were given the impression that time not spent in front of a class was considered wasted time.

Barnett and Nichols (1994) saw "lack of time" as such a critical issue, that they encouraged administrators to "give group members the equipment, software, and ***release time*** -- and possibly ***extra-duty pay*** -- they need to produce technology assisted lessons or units they use with their students" (p. 41). They also suggested hiring an all-day substitute teacher or "rover sub" to fill in for elementary school teachers, one at a time, so that teachers could participate in training or development activities in one hour blocks.

Barnett and Nichols (1994) also found "informal contact with other teachers" to be a strong predictor of integrated use of technology. Becker and Riel (2000) found that the more that teachers were involved in formal and informal communication with their peers, the more they used computers in exemplary ways. Time spent with other teachers in their own school and from other schools appeared to have a strong, positive affect on their use of technology in the classroom.

Summary

Although there is an overwhelming amount of literature related to the successful integration of technology in education, most of these studies and articles have similar themes. These topics include seeking scientific proof that technology can improve academic test scores, pushing for curriculum-centered technology programs, examining the cause and effect of teacher attitudes, identifying and reducing barriers such as inadequate hardware, software and support resources, improving staff development training; and recognizing the importance of preparation and development time.

CHAPTER THREE

DESCRIPTION OF THE PROJECT

Overview

In order to evaluate the correlation between the successful integration of computer technology in the classroom and the need for dedicated preparation and development time by classroom teachers, a simple survey study was conducted. A survey was developed to measure the types of technology-related activity occurring in the classroom, estimate each teacher's investment of time (both during school hours and on personal time), calculate the number of hours of formal computer training that teachers have received, and assess the resources that are available to these teachers.

Description of the Sample

The sample used for this study included all second, third and fourth grade teachers from the 41 elementary schools in the Diocese of Grand Rapids, a potential pool of 142 participants.

The sample was limited to these three grade levels for two main reasons. The first reason was that second through fourth grade students should have adequate developmental and reading skills necessary for working independently on the computer, while students in younger grades might be precluded from many integrated computer activities because they lack these skills.

The second reason was that, beginning in the fifth grade, most classrooms are no longer self-contained where one teacher teaches all the major curriculum areas (math, reading, social studies, language arts, science, etc.). Teachers in upper grades often teach one subject to many classes of students, and have the advantage of presenting the same material to more than one group, thus reducing the amount of preparation time needed to implement a curriculum change that integrates technology.

By limiting the survey sample to second, third, and fourth grade teachers, a more homogenous sample was provided, one that was less influenced by the differences in teaching very young children or in teaching outside of a self-contained classroom.

The Diocese of Grand Rapids was chosen because it provided a mixed group of participants. It was neither a wealthy nor a homogeneous school district, but, rather, was a collection of schools with a variety of socioeconomic circumstances. The children and the teachers in these schools came from a mix of rural and urban households, upper and lower economic settings, and from a variety of cultural backgrounds.

Because of the absence of federal and state funding, these schools' technology programs may have been less advanced than many other public schools. This was seen as an advantage in selecting a sample audience for this research. Whereas a school district with abundant funding for state-of-the-art cquipment and highly-trained support staff might provide an environment more conducive to integrating technology, most school districts in this country continued to struggle with minimal (or outdated) technology resources. The challenges of limited resources, time and support, as faced by the sample teachers surveyed, were common to many school districts across the country.

Description of the Instrument

A sample of the survey is included at the end of this report (See Appendix D). The survey was designed to take each teacher less than thirty minutes to complete. As written in the instructions, however, it was recommended that the teacher read over the survey in its entirety and reflect on it overnight before completing it.

Teachers were also encouraged to write any anecdotal information in the margins to help clarify their responses. Since one of the most common flaws with survey studies is that the questions are misunderstood or are not worded properly, participants were encouraged to add details that might ensure that their responses are accurately reported.

Some of the questions on the survey were included to gather information that will be of interest to the participants and their administrators, and did not directly relate to the hypothesis of this research study. Question 19, in particular ("...what are the current needs at your school in terms of educational technology?"), was included to provide insight into teachers' perceptions of technology needs which could be helpful to school administrators and technology committees as they plan for the future.

Questions 1-10 provide a self-assessment by teachers of their use of technology and measure their perception of barriers that hinder technology integration in their classrooms. For example, questions 6 and 7, respectively, ask "How would you rate the computer software currently available to you?" and "How often does the availability of computers hinder your ability to use technology?" It was important to gather a qualitative measure of technology barriers such as inadequate software, hardware problems, and lab availability. As mentioned previously, limited resources are to be expected, but

excessive technology barriers could significantly skew the results of this study by making technology integration impossible.

Questions 11-14 measure the successful integration of technology into the classroom (see table 1 below). Responses to each of these questions will be weighted and tallied to give each participant a final technology integration score, or "Tech Score."

11	How much time each week (on the average) do your students use computers to complete any of the following tasks under your supervision?
12	How much time each week (on the average) do you use computers to complete any of the following tasks?
13	How often do you and/or your students use computers in each of the following curriculum areas?
14	How often do you or your students use each of the following kinds of software?

Questions 15 and 16, respectively, measure each subject's investment of time pertaining to the integration of technology in their classroom during the school year and during vacations. Responses given to question 15 (How much time each week do you spend using the computer for school-related tasks?), will be multiplied by 36 (the typical number of weeks in one school year). This value will be added to the response given in question 16 (How much time this past year have you spent during vacation time working on the computer on school-related tasks?), to determine the total number of hours invested or "Time Score" for each respondent.

Explanation of the Procedures

A target time period for conducting this survey was during the months of January, February or March. There are generally fewer vacation periods during this time period, and classrooms are settled into their routines for the year. By this time of year, teachers

would also be able to judge how often and in what ways they were using computer technology on a regular basis.

At the annual Diocesan school administrator's meeting in January, the Superintendent of Catholic Elementary Schools presented this project and encouraged all schools to participate. A formal letter of explanation was sent to each school administrator from the superintendent in February (See Appendix A). This letter explained the purpose and scope of this project and reinforced the importance of timely participation.

The superintendent's office provided a list of school administrator names and the number of grade 2-4 teachers in each building. They also provided pre-printed mailing labels addressed to each school administrator.

In early March, each school administrator received a packet containing a cover letter (See Appendix B), and one survey for each grade 2-4 teacher. Each survey included a short cover note with instructions and a stamped and addressed return envelope (See Appendix C).

Participants were given until the end of the month to complete and return the survey forms. While the deadline coincided with the weekend before Spring break, it was anticipated that some teachers would discover forgotten surveys during vacation and still take the opportunity to complete them.

Internal Validity

One of the greatest threats to the validity of a survey study is the survey instrument itself. Before developing the instrument used in this project, many similar research studies were reviewed and the survey questions analyzed (Cummings, 1998;

Matthews, 1998; Wolosoff, 1998; Schick, 1996; Larner & Timberlake, 1995; Moersch, 1995; Appalachia, 1991). Once the survey was drafted for this study, it was reviewed by numerous educators and computer professionals in an effort to ensure precise and accurate responses. The survey was slightly modified based on this feedback, e.g. clarification was added to questions 15 and 16, elaborating on what "time" to include or exclude in their responses. The survey was reviewed one final time by another computer educator before sending it out to the teachers.

In addition to the threat posed by the survey instrument itself, another significant threat to the validity of this study is the possible presence of excessive technology barriers such as unavailable hardware or software. As previously mentioned, survey questions #1-10 were written to quantitatively measure and account for this possibility.

A final threat to the validity of this study is that the number of surveys returned might provide a sample too small to be meaningful. It is common to have a response rate of 20% or lower in response to a single survey mailing (Doyle, 2001). While some interesting observations may be made with a smaller sample, in order to make any meaningful extrapolations, the goal for this project was to obtain a data pool from at least fifty respondents or 35% responding.

Plan for Data Analysis

Once the completed surveys were received, and the responses tallied, a number of comparisons and calculations were performed. First, an analysis was done to see what kind of a sample had been obtained. In other words, a profile of who the respondents were was drafted – did they teach in self-contained classrooms, what level of experience

and computer skills did they have; and what was their perception of how well they were integrating technology into their classrooms.

Next, simple tallies and averages were done to calculate how many respondents used technology in each of the subject areas, how many respondents felt hindered by inadequate or unavailable resources, and how many computers were consistently available for their use.

Based on responses to the questions regarding how frequently various kinds of software were used, and how broadly technology had been integrated into different subject areas, an overall "technology score" was calculated for each respondent. As mentioned previously, this "tech score" was calculated by weighting the responses to questions 11-14 with values from 0-6, and by then adding these together to calculate a total "Tech Score" that represented the level of technology integration in the classroom.

Similarly, a "Time Score" was calculated for each respondent that assigned a representative value to the amount of time he/she spent working with technology either to prepare lessons or to perform administrative tasks. This "Time Score" was calculated by multiplying the response to question 15 by 36 (the typical number of weeks per year) and by then adding it to the response to question 16 (the number of hours spent during vacation time using technology).

A correlational coefficient was calculated to demonstrate the relationship, or lack of one, between a respondent's "tech score" and their "time score". A scatterplot was used to graphically illustrate this correlation. Additional relationships between the availability of resources, the amount of formal training received, and the level of technology integration were also analyzed.

CHAPTER FOUR

DESCRIPTION OF OUTCOMES

Overview

Out of one hundred forty-two surveys distributed to thirty-eight different elementary schools in the Diocese of Grand Rapids, ninety-five surveys were returned, representing thirty-five different schools. In other words, sixty-five percent of the surveys distributed were returned with representation from ninety two percent of the schools in the diocese. This far surpassed the goal of thirty-five percent responding.

In addition to receiving an acceptable number of surveys returned, the completeness of these surveys was also better than expected. Less than one percent of all of the questions asked had a non-response (0.58%). This overall high response rate provides an excellent data pool on which to base the analysis of this study.

Profile of Respondents

The surveys returned represented an excellent cross section of "average" computer users. Only seven percent of the respondents consider themselves to have "advanced experience". Seventy-three percent of the respondents characterized themselves as having "some experience" with computers, and another twenty percent as having "very little experience". None of the survey respondents identified themselves as having had "no experience" at all (see Figure 1).

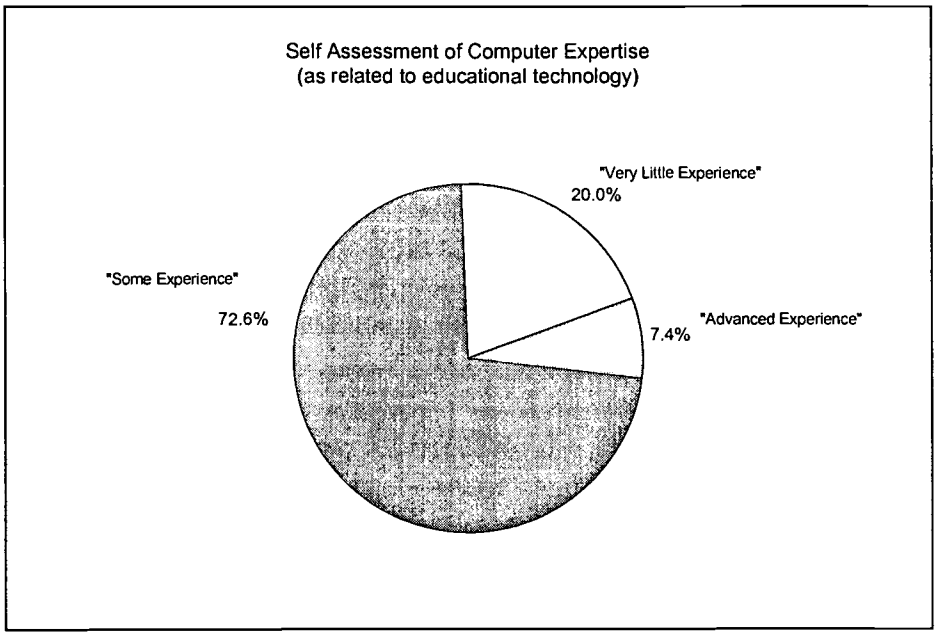

Figure 1

Based on responses to question number eighteen, all but two of the respondents teach in self-contained classrooms, teaching at least five of the following subjects to their students: math, reading, social studies, English, science, writing, and religion. As it must be assumed that building administrators appropriately distributed all surveys to second, third and fourth grade classroom teachers, responses from the two teachers with less varied classroom responsibilities were still included in the final survey results.

Profile of Technology Use

A review of the different ways that teachers spent their time using technology provided some interesting results. Figure 2 shows a breakdown by task of how these teachers use technology for school-related tasks that do not directly involve their students.

Survey results showed that teachers use technology most often just for typing. It could be assumed that this could include typing class handouts, quizzes, parent. newsletters, etc. The percentage of respondents using computers to type and edit

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documents for at least one hour each week was 68.4 %. Of these respondents, 16.9%, spent over three hours a week typing documents.

A significant number of respondents, 75.8%, spent at least some time each week using the Internet. Ten percent of the respondents spent over three hours each week doing research on the Internet and using e-mail programs.

Only 32.6% of the respondents, however, spent any at all time recording student grades on the computer. Fifty-eight percent of the teachers never spent any time reading articles about education and technology. In addition, 74.2% of the respondents say that they never spent any time at all preparing technology lessons.

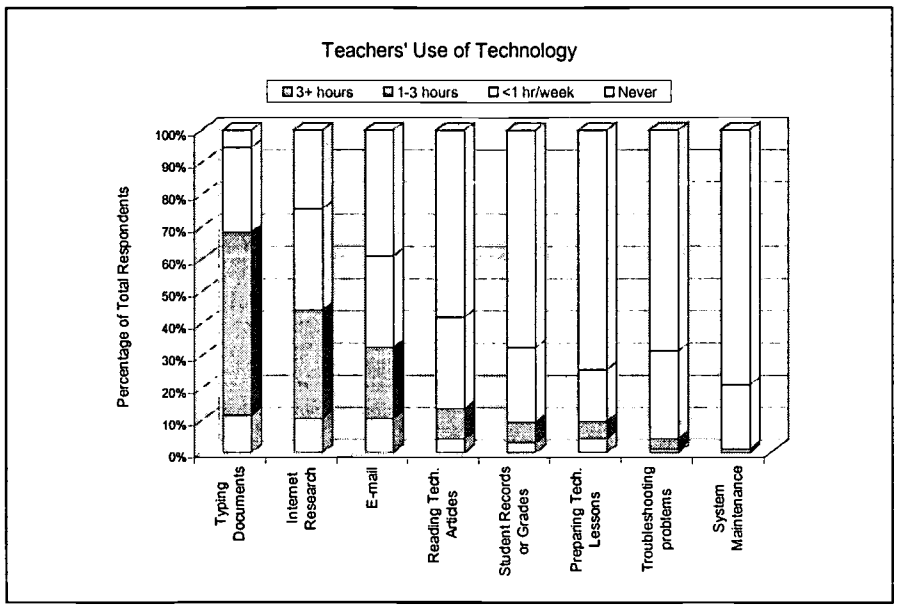
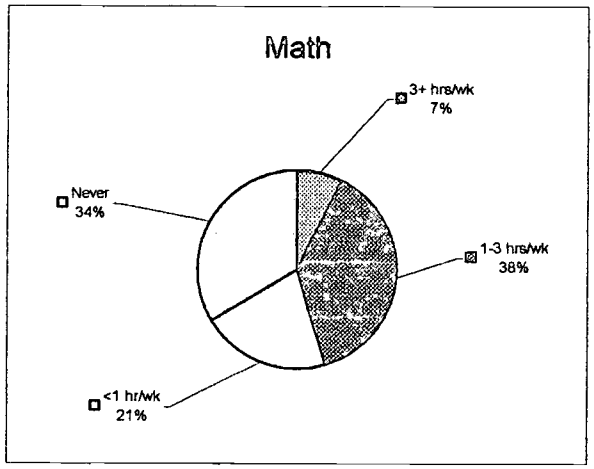
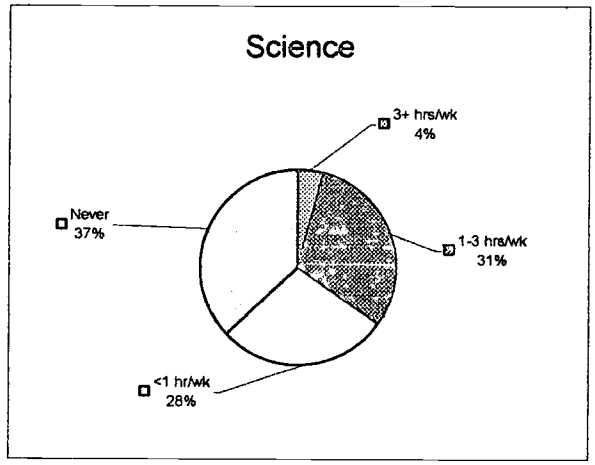
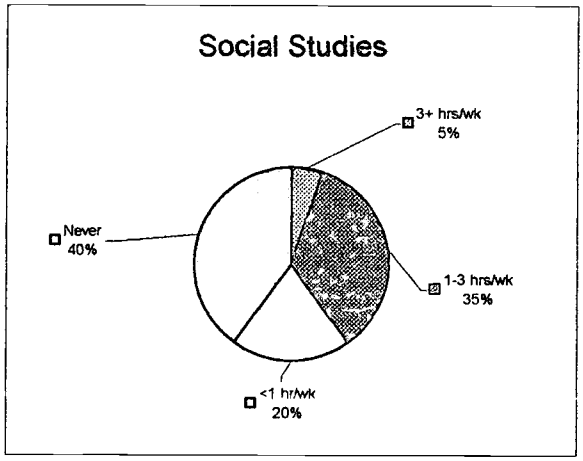


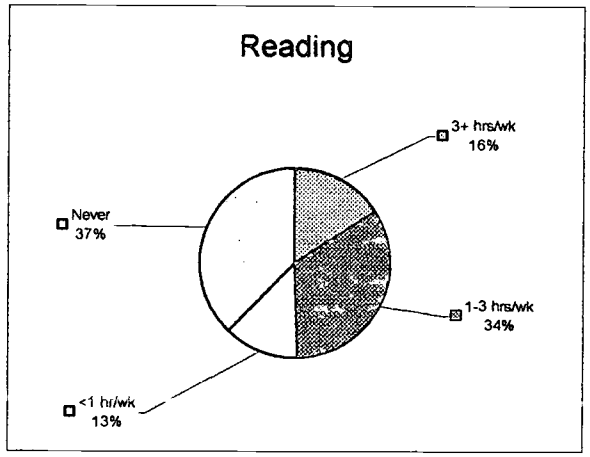
Figure 2

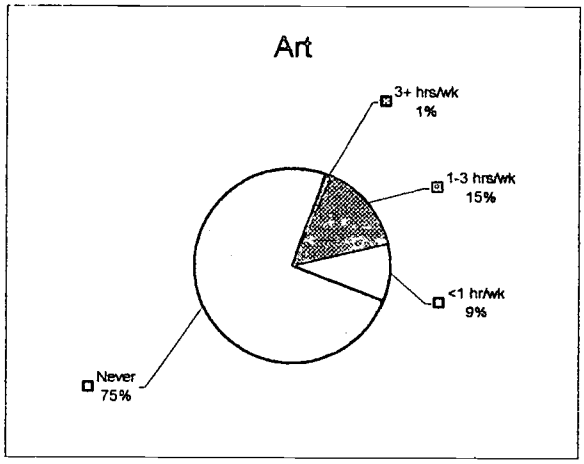
Not only were teachers using technology in a variety of ways to assist with classroom administration, but they were also using technology with their students in a variety of curriculum areas. Figure 4 illustrates how frequently teachers used technology in each of the major curriculum areas. The percentage of teachers using technology at least occasionally for reading, math, science, writing, and/or social studies was 41.8%.

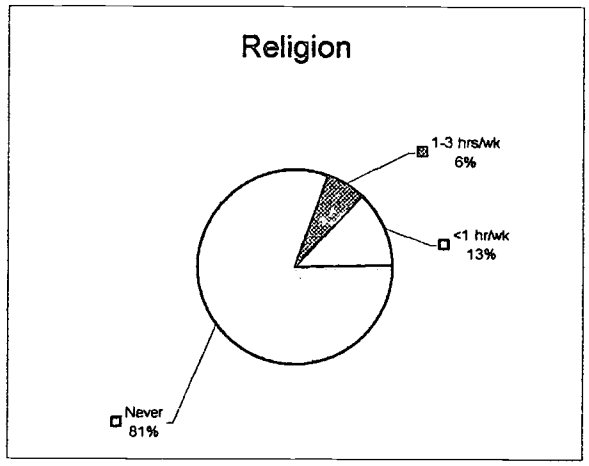


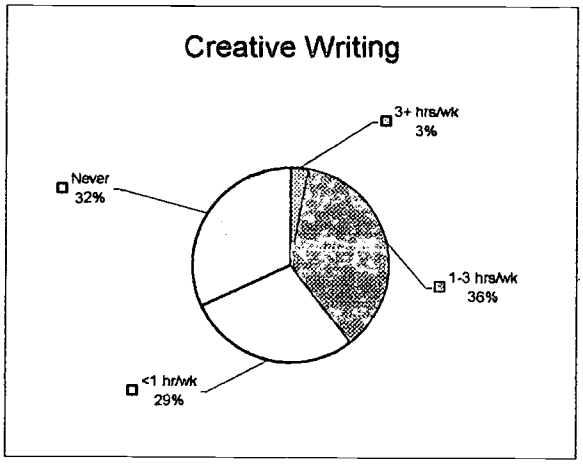


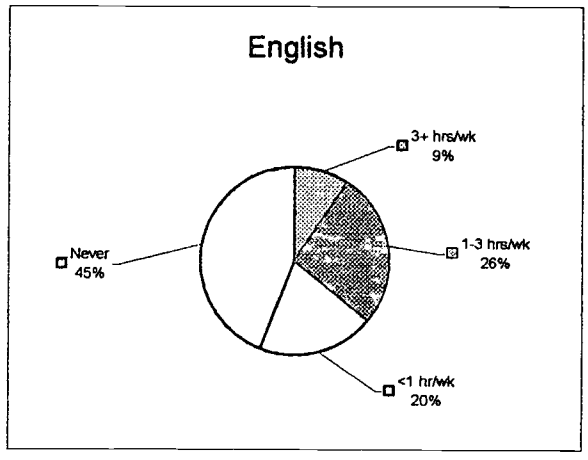












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The table below summarizes the results to questions 13, "How often do you and/or your students use computers in each of the following curriculum areas?"

	Frequently (almost daily)	Occasionally (monthly)	Rarely (once or twice/year)	Never
Math	9.5 %	26.3 %	20.0 %	44.2 %
Science	4.2 %	30.5 %	28.4 %	36.9 %
Social Studies/History	5.3 %	34.7 %	20.0 %	40.0 %
Reading	15.8 %	33.7 %	12.6 %	37.9 %
Creative Writing	3.2 %	35.8 %	28.4 %	32.6 %
English/Language Arts	9.5 %	26.3 %	20.0 %	44.2 %
Religion	0.0 %	6.4 %	12.8 %	80.8 %
Foreign Language	0.0 %	0.0 %	17.0 %	83.0 %
Art	1.1 %	14.7 %	9.5 %	74.7 %
Music	0.0 %	0.0 %	8.5 %	91.5 %

Table 1

Quantifying Successful Technology Integration

The focus of this study is on the successful integration of technology into traditional classrooms. However, as previously stated, successful technology integration can mean many things to many different people. For the purpose of this study, successful technology integration will be measured by looking at the frequency and breadth of use of technology by students and teachers for school-related activities.

The survey contained four questions that focused on the successful integration of technology into the classroom. These questions (#11-14) were concerned with the frequency of technology use in a variety of settings and applications (see Figure 4). Responses to these questions were weighted and tallied in order to arrive at a measure of successful integration of technology. For the remainder of this report, this measure will be referred to as the respondent's technology integration score or "Tech Score":

Survey Question	Response	Weighted Score
11. "How much time each week (on the average) do your students use computers to complete any of the following tasks under your supervision (not with a "computer" teacher)...	3+ hours per week/frequently 1-3 hours per week/occasionally <1 hr per week/rarely Never	6 4 2 0
12. How much time each week (on the average) do you use computers to complete any of the following tasks...	3+ hours per week/frequently 1-3 hours per week/occasionally <1 hr per week/rarely Never	6 4 2 0
13. How often do you and/or your students use computers in each of the following curriculum areas...	3+ hours per week/frequently 1-3 hours per week/occasionally <1 hr per week/rarely Never	6 4 2 0
14. How often do you or your students use each of the following kinds of software...	3+ hours per week/frequently 1-3 hours per week/occasionally <1 hr per week/rarely Never	6 4 2 0

Figure 4

The resulting "Tech Scores" ranged from 0 to 134, with an arithmetic mean of 54.4 and a median of 52. Figure 5 illustrates this somewhat irregular distribution curve. As might be expected, this chart shows a trailing off on either end of the distribution curve, with relatively few non-users and relatively few high-end users. The multiple peaks in the distribution curve, however, indicate that the majority of technology users fall into three loose groupings, perhaps indicating stages or "plateaus" of technology use.

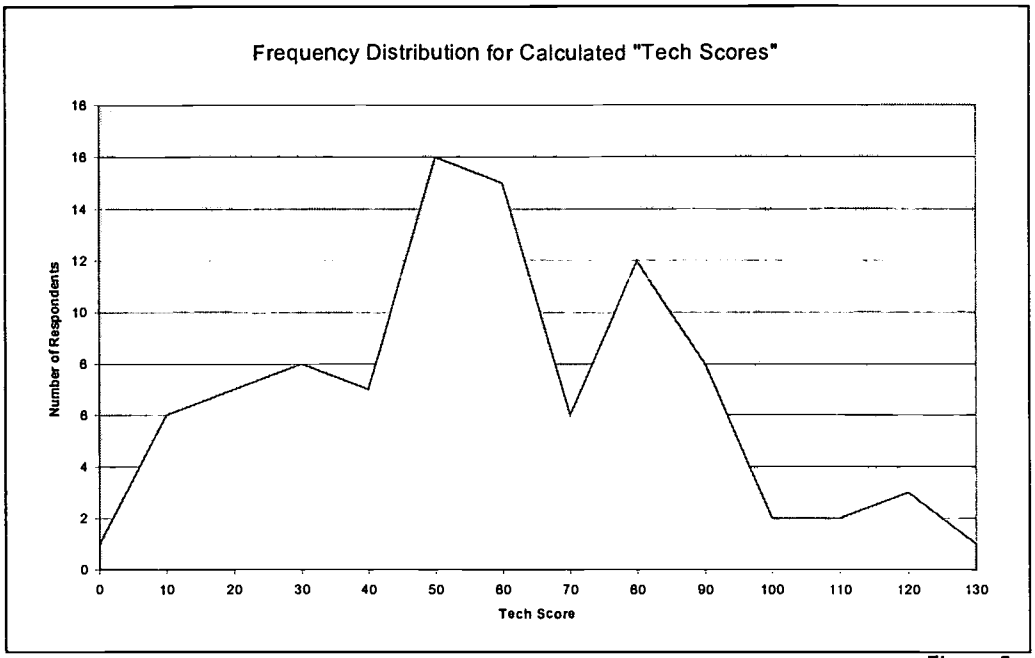

Figure 5

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Self Assessment and the Technology Integration Score

The second question on the survey was written to elicit a subjective self-assessment of the respondent's integration of technology into the classroom. In comparing the weighted technology integration score, or "Tech Score" as described above, to the respondents' subjective self-assessment, a fairly strong correlation can be seen. The correlational coefficient between these two measures was 0.495658. Figure 6 shows the strong relationship that exists.

This relatively strong correlation between the "Tech Score" and the respondent's perceived level of technology integration, helps to lend validity to this survey and the method of measurement being used. If a strong correlation was not seen, the methods being used could have been considered far less reliable.

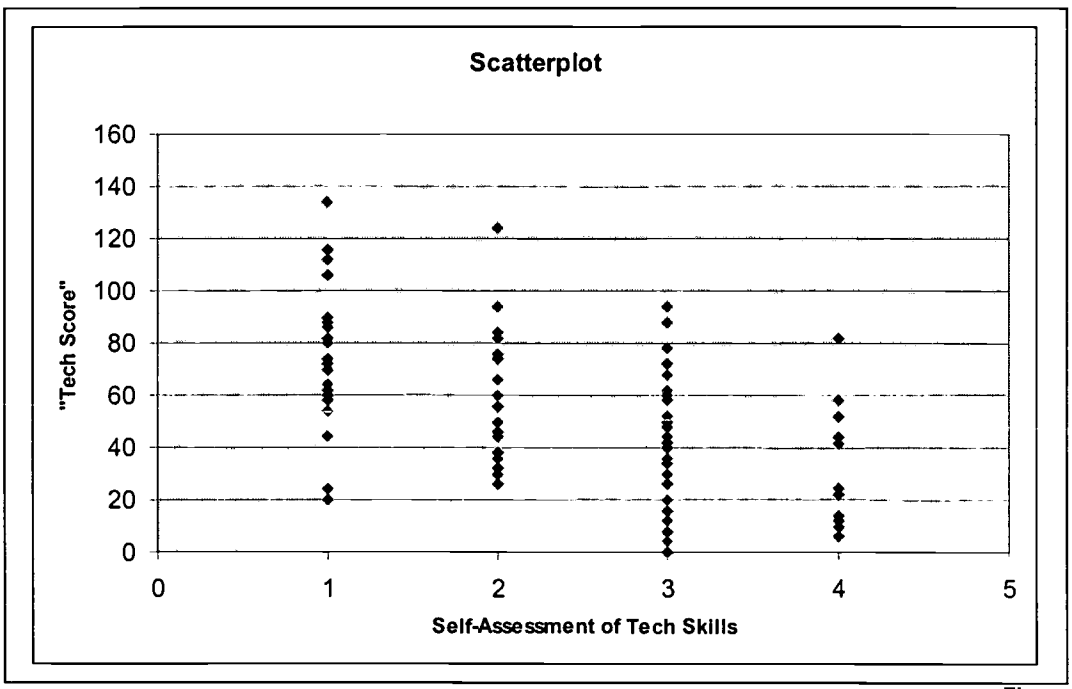

Figure 6

Affects of Inadequate Resources

Many factors exist that can affect a teacher's ability to use technology with their students. Some of these include equipment availability, limited software choices, and technical support problems. Figure 7 indicates respondents' perception of these external factors.

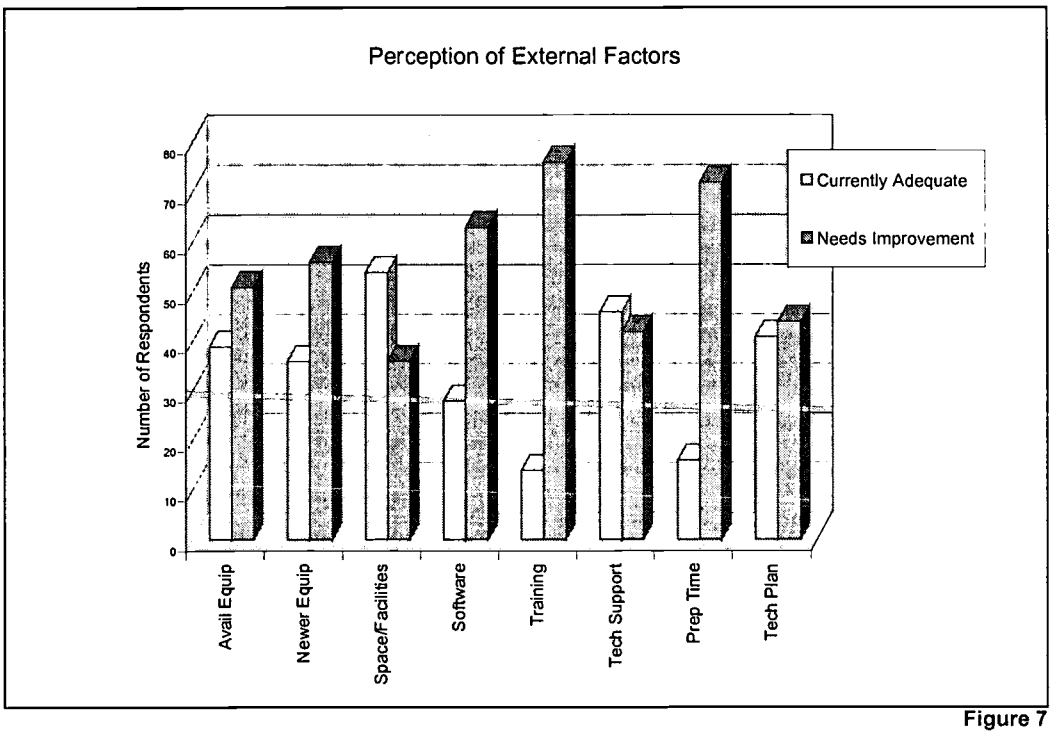

Figure 7

Fifteen percent of the teachers responding cited equipment availability as a critical current need in their schools. Sixty-one percent stated that they need newer equipment, and sixty-seven percent felt that they need additional software. In order to evaluate the effect of these external factors, additional analysis was done pertaining to the adequacy and availability of resources and the level of technology integration in the classroom, a description of this analysis follows.

Questions four through nine all concern the respondent's opinion regarding equipment availability and related barriers to technology usage. Respondents were asked

to report on the availability of computers in the classroom and computer labs, to rate the software and technical support available to them, and to report the frequency with which lab availability or computer problems hinder their ability to use technology. An "Availability Score" was calculated by weighting the responses to these five questions.

An analysis was then performed to see if a relationship existed between the availability of computers and the level of technology integration. The resulting correlation between the calculated "Availability Score" and the measured "Tech Score" was surprisingly minimal, however, at only 0.269989956 (See Figure 8). Even analyzing each of the factors used to calculate the overall "Availability Score," neither equipment problems nor a lack of availability provided a strong indicator of weak technology integration. The strongest link can be seen between the adequacy of available software and technology usage, with a correlational coefficient of only 0.369727885.

	Correlational Coefficient to Technology Integration Score
"Availability Score"	-0.269989956
# of computers in the classroom	0.057005215
Frequency of computer problems	0.029671377
Frequency of availability problems	0.006086458
Adequacy of available software	0.369727885

Figure 8

In spite of these negative external factors, teachers appear to making the best of the resources they have. Very little correlation was seen between the adequacy and availability of resources and the level of technology integration in the classroom.

Analysis of the Investment of Time

The hypothesis of this study is that there is a strong correlation between the amount of time invested by teachers on educational technology, and the level of successful integration of technology into the classroom. For the purpose of this study, a teacher's investment of time includes time spent during and after school, time spent

working with the students, and time spent working independently on the computer performing administrative tasks.

In order to quantify each respondent's investment of time, answers to question fifteen ("How much time each week do you spend...") were multiplied by thirty-six, the typical number of weeks in one school year. This value was then added to the response given for question number sixteen ("How much... vacation time do you spend...") to arrive at a total time investment measurement or "Time Score".

The average "Time Score" invested by teachers was 179 hours/year; the median Time Score was 161. The lowest Time Score was 0; the highest Time Score was 678. A distribution curve for these results in shown in Figure 9. As illustrated in this chart, most teachers spend between 80 and 250 hours each year working with technology.

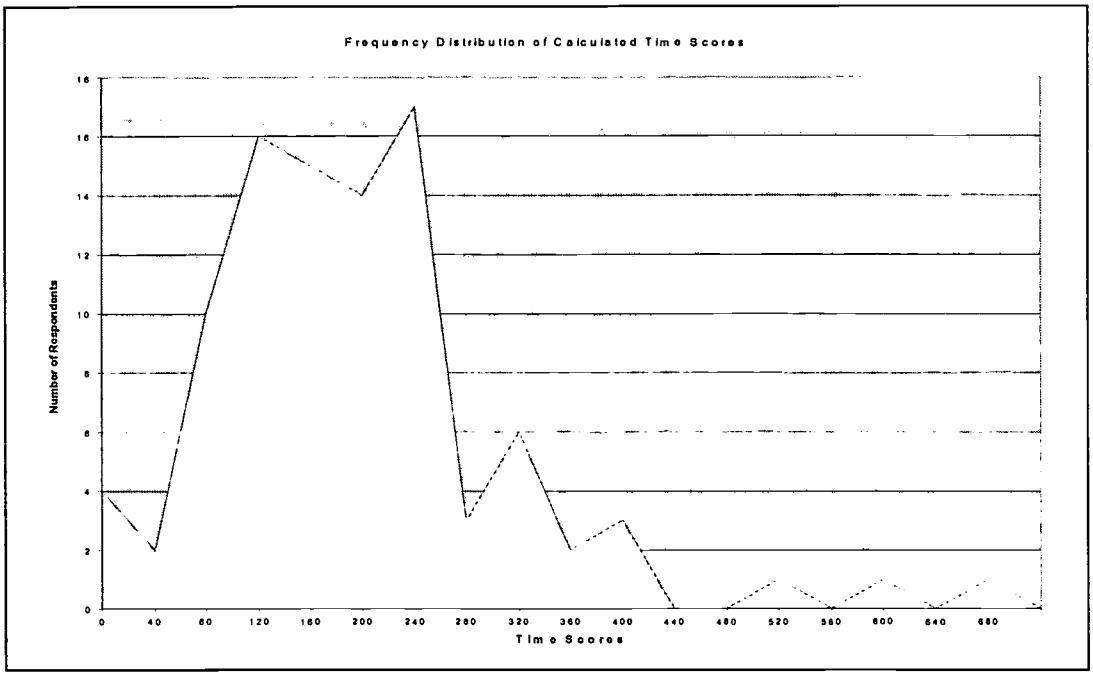

Figure 9

An analysis was done to see if a relationship exists between the total time spent ("Time Score") and the effective integration of technology into the classroom ("Tech

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Score"). As predicted in the original hypothesis for this project, a significant correlation was seen between these two factors. The resulting corresponding coefficient of 0.452628063 indicates a fairly strong relationship, as graphically indicated in Figure 10.

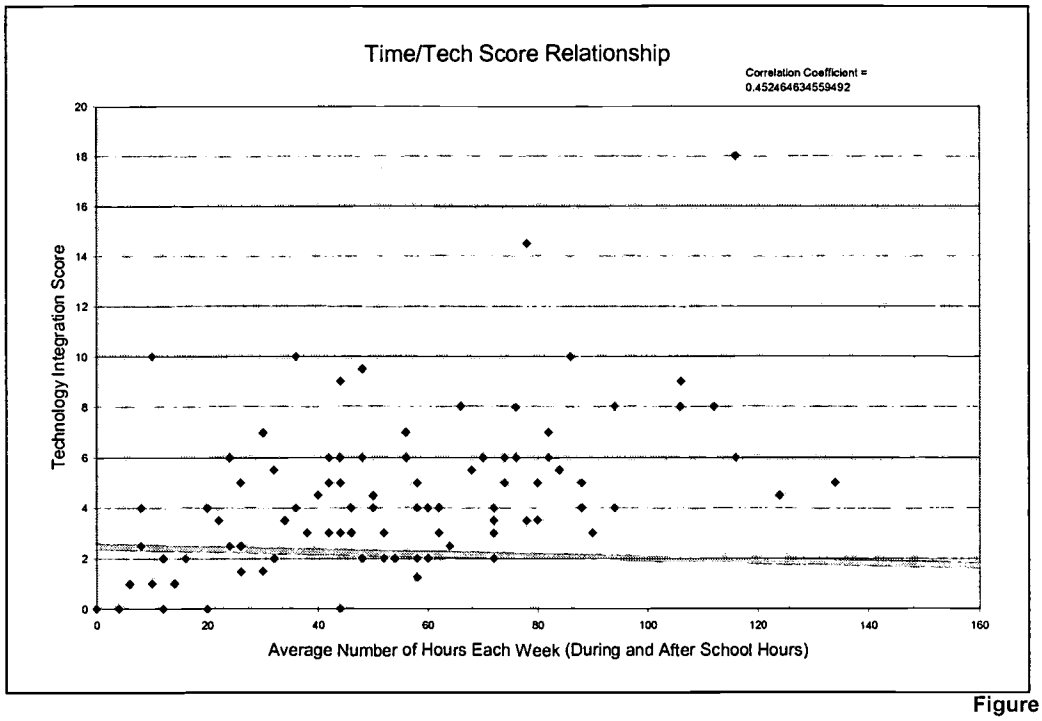

Figure 10

Further analysis, however, shows an interesting distinction between time spent during school hours and time spent after school or on vacation. The relationship between a respondent's Tech Score and their Time Score, is largely due to a strong correlation between time teachers spent during school hours to use technology and the level of technology integration in their classroom. Figure 11 shows that neither the amount of time spent during vacations, nor the time spent after school hours carry a strong relationship to the level of technology integration in the classroom.

	Correlational Coefficient to Technology Integration Score
"Time Score"	.045268063
Time spent during school hours	.043525531
Time spent after school hours	.0295709907
Time spent during vacations	.0135884675

Figure 11

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While many teachers spent a great deal of time outside of school and on vacations, using the computer for school-related tasks, this investment of time outside of school time could not be seen as a direct indicator of how well the technology would be integrated into the classroom. The reasons for these results could certainly be multi-faceted. For example, some teachers may not be able to take the next step to integrate the technology into their classrooms on a daily basis, even though they have spent many, many hours of their personal time learning about and working with computers. This could be due to a lack of meaningful training, availability of equipment, inadequate software, or an absence of practical mentoring or role models.

Overall, these survey results illustrate the complexity of analyzing technology integration in the classroom. It is important to consider these many interrelated factors that contribute to the success or failure of a technology program, and to reflect on the relationship between these factors when proposing explanations or solutions. This chapter summarizes the quantitative results of this survey study. The next chapter will provide further reflection on these results and present the final conclusions from this project.

CHAPTER FIVE

REFLECTIONS AND CONCLUSIONS

Although the results from this survey study were not as dramatic as expected, they did demonstrate a significant relationship between the level of technology in the classroom and the number of hours that a teacher spends preparing for and working on technology. As the simple volume of research on this topic indicates, however, the topic of educational technology is a broad and multi-faceted issue. There are many related factors that must be recognized in order to understand the importance of "time" as a critical success factor to the integration of technology into the classroom.

Teacher Attitude

Much of the original research that examined why teachers were not making good use of technology either stated or implied that it was because of their attitude (Rogers, 1999; Cummings, 1998; Harvey & Purnell, 1995; Larner, 1995; Quality Education Data, 1995). Initially many teachers did have a negative bias toward computers, for a variety of reasons. Because most schools have had either inadequate hardware, software, training, support, and/or development time, many teachers have had a legitimately negative attitude toward technology. As educators have become more familiar with computers and the technology itself has become more useable, research shows that teachers' attitudes have improved (Mann & Shafer, 1997; Rogers, 1999).

The results of this survey study found, that fifty-five percent of the teachers surveyed experience computer problems at least once a month, forty-two percent of the respondents say a lack of availability of computers is a problem at least once a month, and fifty-nine percent rate their access to the Internet as "inadequate". Common sense says that it would be difficult not to harbor a bad attitude toward computers when technology problems are this pervasive.

In light of this, "teacher attitude" should be viewed more as an indicator or dependent variable than a predictor or independent variable. As we come closer to providing an ideal environment, with adequate technology, training, and time, "teacher attitude" should automatically become less of a concern.

Curriculum-Based Technology Plans

One of the best ways to create this ideal environment is to have a strong vision and plan for achieving this goal. Much of recent research and related literature emphasizes the importance of following a strong curriculum-based technology plan (Dockstader, 1999; Harvey, 1998; Wolosoff, 1998; Mann, 1997; Harvey & Purnell, 1995). A good technology plan should include strategies for acquiring adequate funding, hardware, software, training, and technical support, but it must first of all be curriculum-based, centered on the teaching and learning process.

When surveyed regarding current technology needs, the respondents indicated that improvement was needed in many areas. Staff development training, preparation and development time, additional software, and updated equipment with improved availability were some of the most frequently cited needs. Fifty-one percent of the

respondents felt that an improved School Technology Plan was needed, twenty-three percent responded that it was "critically needed."

Technology should be viewed as a means to achieve educational objectives, not an objective in and of itself. As Morrison & Lowther (2002) point out, it should be a tool available to students to aid in the learning process, not just a glorified delivery system for the teachers to utilize. Technology, they say, should be used as a problem-solving tool in open-ended learning environments, not just as a substitute for presenting material to the students.

> We have seen that schools use computers to deliver instruction through games, drill-and-practice, and tutorial software. If we were to conduct a survey of the students' parents who user computers a work, we would most likely find that parents use computers differently. Computers are used as a *tool* to solve problems in the workplace (Morrison & Lowther, 2002, p. 4).
>
> Our focus will shift from the skill of just using a computer (e.g., keyboarding) to one of knowing not only how and when to use a computer, but how to use the computer to solve a problem (Morrison & Lowther, 2002, p.15).

Educators must develop and enact school technology plans that are focused on using technology as a tool to enhance education. These technology plans must be curriculum-based, focused on teaching high-level thinking skills that use technology to solve problems and creatively develop solutions to real life challenges.

Access to Technology Equipment

Technology plans must include provisions for maintaining adequate hardware, software and technical support resources. In order to integrate technology into the

classroom, it is imperative that computers be readily available for teacher and student use.

In this study, eighty-two percent of the respondents had no more than one or two computers available in their classroom. Eighteen percent had no computers at all within their room. Most schools reportedly had a computer lab available for teachers to use with their classes, but twenty-eight percent said the lab was either rarely available or was otherwise inadequate. Eight percent of the teachers surveyed had no computer lab available at all.

Research shows that there are inherent problems with relying on a shared computer lab for classroom technology use.

> To use a computer lab, teachers have to schedule the lab in advance and move the class between rooms. These labs are not always available and might require scheduling several weeks in advance. This lack of easy access makes it difficult to plan a lesson integrating computers (Morrison & Lowther, 2002, p. 15).

Currently, many teachers find it difficult to fully integrate technology tools into the classroom because of a lack of access to technology equipment. Hopefully in the future, as personal computers become more reasonably priced and smaller in size, technology will be more readily available within each classroom setting. Until then limited availability will continue to be a barrier to full technology integration.

Need for More Training

A lack of adequate training is certainly one of the most common complaints among teachers. In this study, eighty-four percent of the respondents identify training as a current need in terms of educational technology. Sixty-six percent of the teachers have

received less than twenty hours of formal computer training. Of these, sixty-five percent have received fewer than ten hours of formal computer training.

As the results of this and many other studies have shown, teachers feel that there is a critical need for additional technology training (Bailey, 2000; Clifford, 2000; McCannon & Crews, 2000; Becker, 1999; Rogers, 1999; Anderson, 1998; Barnett & Nichols, 1994). Most teachers are interested in and would benefit from hands-on classes, one-on-one training, or appropriate self-study materials. Technology plans should strive to allocate more funding and staffing toward this end.

Previous studies have shown that this training must be applicable, timely, and on-going (Clifford, 2000; McCannon & Crews, 2000; Becker, 1999; Rogers, 1999; Anderson, 1998). When scheduling this training, every effort should be made to make the time and location of the training as convenient as possible in order to ensure the greatest participation. As many districts have discovered, if the training is either poor quality, impractical, costly, or inconvenient, teachers will choose not to participate (Clifford, 2000; McCannon & Crews, 2000; Rogers, 1999; Harvey & Purnell, 1995).

The conclusion of this study, however, is that just providing additional training will not be enough. After completing training, a teacher still needs the time to apply what they have learned and to implement these new teaching strategies. In order for teachers to successfully integrate technology into the classroom, teachers need to have adequate time to prepare and develop technology-rich lessons.

Need for More Time

Although good technology planning, improved availability of resources, and additional training can be viewed as critical to the success of technology integration, the

most important factor, and least recognized, is the need for more ***time***. In order to make use of technology, teachers must have the time available to explore these resources and develop new teaching strategies that make use of these new tools.

It takes a great deal of time and effort to enhance existing curriculums with technology. Teachers need time to explore Internet sites, transfer lecture overheads to interactive computer presentations, learn how to use grading programs, customize drill & practice software, review software, share ideas with peers, test new products, and otherwise create technology-rich learning environments.

For example, there are many wonderful technology resources available for teaching units on the solar system: star gazing software simulations, NASA sponsored Internet sites, Web Quest research projects, animated slide shows, and real-time telescopes online. But, in order for teachers to take advantage of these resources, they must spend many hours investigating the resources, preparing instruction sheets for students, checking for Internet web sites that may have moved or changed, and going through test runs of the procedures students that will follow.

Unfortunately, the responsibility of finding this time usually falls solely on the classroom teacher. Many good teachers are making the extra effort, spending time between classes, after-hours, and during their vacations. But others either cannot or will not choose to spend their time adding technology enhancements to their lessons.

In this study, teachers were found to have spent 179 hours each year, on the average, working with educational technology. Some teachers spent over 500 hours a year working with computers in an effort to find better ways to integrate this technology into their teaching.

As this study has shown, a strong correlation exists between those teachers who invested this time and the level of technology integration in the classroom (See Figure 10). Even though schools have a responsibility to develop sound technology plans, this study found little correlation between the adequacy and availability of resources and the level of technology integration in the classroom. The strongest indicator of successful technology integration was found to be the investment of time during the school day that teachers spent working with technology either with their students, or on their own.

Teachers themselves are well-aware of the need to spend more time working with computers so that they can better integrate technology into their teaching. Eighty-one percent of teachers indicated that additional preparation and development time was needed in order to utilize educational technology. Of these, thirty-five percent indicated that additional time is "critically needed."

Morrison & Lowther (2002) quote a third grade teacher who describes her frustrations as she diligently tries to integrate technology into her classroom:

> I received another week of basic computer training before I received my computers. The training, however, did not focus on how to implement this technology into the curriculum. We had already received training on how to use the software applications! I was given the hardware, the software, and instructions on how to use the hardware, and then sent back to my classroom to figure out what to do with all of this. I was very frustrated. I felt that I had been forgotten and this it was going to be my responsibility to figure out how to use these computers. I spent many hours before and after school learning how to use the equipment and I read everything that I could read about computers in the

> classroom... It was not easy. I spent a lot of time preparing lesson plans and developing activities. I had good days and bad days. It was quite an adjustment for me and my students (p. 13).

If school districts are serious about wanting to get the most out of their financial investment in computer hardware and software, it is imperative that they make a concerted effort to give teachers the time they need to implement this technology. Administrators must be creative and actively seek innovative ways to provide teachers with planning and development time focused on technology integration.

Barnett & Nichols (1994) suggest that schools hire a rotating substitute teacher one day a month. This substitute could roam from classroom to classroom in one hour shifts, freeing each classroom teacher for an hour so that he/she could focus on implementing educational technology. As an added safeguard, by requiring teachers to set personal technology goals and provide accountability reports, administrators can be reassured that this time is spent on technology implementation efforts.

Other related suggestions to consider include offering stipends for personal time spent on technology development, setting up peer mentoring programs, providing regular technology presentations at staff meetings, and establishing teacher-student buddy systems where technology-savvy students are paired up with classroom teachers to provide administrative and technical support. Just as each school has different needs and personalities, so too will the solution to providing teachers more time require different approaches. The chief objective is to provide teachers with more time to dedicate toward integrating technology into their classroom curriculum.

Future Research

Future research should be conducted to further examine the effect of allocating dedicated time for teachers to develop and implement lessons that integrate technology. Whether a school has the funding to maintain state-of-the-art equipment or not, the impact of providing teachers with the time to use whatever equipment is available to them could be profound. More specific data should be gathered concerning the exact amount of time teachers spend on various technology-related tasks, and then more detailed analysis done to draw correlations between the level of technology integration they are able to achieve in their classrooms and the amount of time spent on various tasks.

If this particular survey study were to be conducted again, this additional detail regarding the amount of time teachers are spending on specific tasks would be beneficial. For example, it would be helpful to know whether spending time on an activity such as testing educational software has a more profound affect than spending time reading trade journals or other technology-related activities. With more detailed data, better correlations could be drawn and more specific suggestions could be given on how teachers should best spend their time.

A simple way to gather this data would be to use a log sheet on which teachers could record the actual time spent on various tasks over the course of a month. This data, along with data collected from the general survey would provide even better information regarding the amount of time being spent, and the relative impact it has on technology integration in the classroom.

Another interesting consideration that has not been adequately researched and which could provide helpful feedback for administrators is the affect of informal peer contact on increased technology usage. Becker and Riel (2000) found that teachers who had more opportunity to interact with their peers on a regular basis, were more likely to integrate technology into their teaching. While some schools set time at each regular staff meeting to discuss and share ideas on how teachers are using technology, many schools provide little or no opportunity for even casual peer interaction. A quantitative study that explores the relationship between opportunities for peer contact and the level of technology integration in the classroom could demonstrate to administrators the positive influence of peer interaction with technology use.

Summary

In order for school districts to realize a satisfactory return on their investments in technology, they must realize the importance of providing teachers with dedicated time to implement this technology. School districts must not only continue to draft solid, curriculum-based technology plans that ensure access to useable hardware and software resources and which provide ample training focused on integrating this technology, but they must also include provisions for preparation and development time for classroom teachers. It is this essential element, focused time, that will best enable teachers to make fully integrated curriculums a reality.

As this study showed, successful technology integration can be achieved in spite of the many barriers often faced by classroom teachers. Quality teachers know how to make the most out of the resources that they have available, and have found ways to use existing technology in ways that enhance their classroom teaching.

The conclusion of this study is that in order to increase the level of technology integration in the classroom, it is essential that classroom teachers have more time to work with the technology currently available to them. If the goal of a school technology plan is to have teachers integrate technology in ways that enhance the education experience, it is essential that classroom teachers be given not just the hardware and software and training, but also the ***time*** to integrate this technology into their classrooms.

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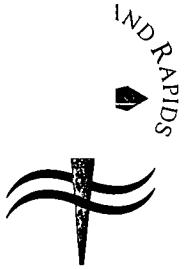
APPENDIXES

APPENDIX A

Diocesan Letter to Administrators



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Secretariat for Diocesan Schools

February 9, 2001

Dear Principals:

The Grand Rapids Diocesan Elementary schools have been invited to participate in a local study that will examine the "Successful Integration of Technology in the Classroom."

By participating in this project, our schools will receive specific feedback regarding ways to better use existing computer equipment in our schools to enhance traditional education programs. Thousands of dollars have been spent on technology programs in our schools, by participating in this study we hope to help maximize that investment.

Participation will require a very minor time commitment. A one-time survey will be distributed to all second through fourth grade classroom teachers in your building. Once received, the teachers will have one week to complete and return the survey in a self-addressed, stamped envelope. The survey should take less than 30 minutes to complete. There are no additional obligations.

The study is being conducted by Susan English, an adjunct faculty member and graduate student at Aquinas College. Susan is certified in elementary education but has been using her teaching skills to teach computer software courses since the early 1980's. She has conducted numerous training sessions for teachers and is familiar with the struggles of integrating technology into the classroom.

Keeping up with technology, and implementing a successful technology program is a big challenge. Regardless of each school's current level of technology integration, we all have room for improvement, and, so, we encourage all our schools to participate and support this study.

In a few weeks you will be receiving a packet of surveys in the mail to be distributed to your 2nd, 3rd, and 4th grade classroom teachers. Please help to ensure that the surveys are completed and returned in a timely manner. Gathering accurate and thorough data will be critical to the success of this study.

If you have further questions, please feel free to contact me or Susan English directly at 459-8281, ext. 3630.

Sincerely,

James E. O'Donnell

James E. O'Donnell
Superintendent

Sample Survey Enclosed

600 Burton St. SE Grand Rapids, MI 49507-3278 (616) 243-0491 Fax (616) 243-1442

APPENDIX B

Cover Letter Sent with Survey Packets

Susan J. English

2324 Okemos Dr. S.E., Grand Rapids, Michigan 49506

March 8, 2001

Dear Principals:

Enclosed are the technology survey packets to be distributed to all 2nd, 3rd, and 4th grade classroom teachers in your building. This is part of the "Successful Integration of Technology" study previously introduced to you by Superintendent Jim O'Donnell.

As previously explained, participation will require a very minor time commitment. This one-time survey should take teachers less than 30 minutes to complete. You can assure your staff that answers will remain confidential; responses will be combined to provide cumulative statistics.

Teachers should complete and return the survey in the self-addressed, stamped envelopes at their earliest convenience. Completed surveys are due by **March 31** at the latest. Please help to ensure that the surveys are completed and returned in a timely manner, as gathering accurate and thorough data will be critical to the success of this study.

Upon completion of this study (early/mid-summer), the diocese will receive a complete report on these results. In addition to a formal summary, administrators will also be provided with a list of practical (and affordable) suggestions for improving K-8 technology integration. Maintaining a strong technology program can be a frustrating and costly endeavor; the feedback you will receive, however, should provide you with a better understanding of this challenge and help you maximize your investment.

Your participation and support is *greatly appreciated.* If you have any questions or need additional packets, please feel free to contact me at (616) 459-8281, ext. 3630, or at my home number, (616) 245-7380.

Sincerely,

Susan J. English

Enclosures: Grade 2-4 Survey Packets

APPENDIX C

Survey Instructions

urvey has been distributed to all 2nd, 3rd and 4th grade teachers in the Grand Rapids area Catholic schools. Feedback from this survey will be provided to all diocesan administrators in an effort to better support the integration of technology in our schools. Your accurate and honest feedback is essential! If you have any questions, please feel free to contact me at 245-7380. Thank you, in advance, for your time and participation.

Susan English
Director of Technology Courses, Aquinas College
Master in the Art of Teaching (M.A.T.) Candidate

*Please return this completed survey by **March 31**.*

This survey has been distributed to all 2nd, 3rd and 4th grade teachers in the Grand Rapids area Catholic schools. Feedback from this survey will be provided to all diocesan administrators in an effort to better support the integration of technology in our schools. Your accurate and honest feedback is essential! If you have any questions, please feel free to contact me at 245-7380. Thank you, in advance, for your time and participation.

Susan English
Director of Technology Courses, Aquinas College
Master in the Art of Teaching (M.A.T.) Candidate

*Please return this completed survey by **March 31**.*

This survey has been distributed to all 2nd, 3rd and 4th grade teachers in the Grand Rapids area Catholic schools. Feedback from this survey will be provided to all diocesan administrators in an effort to better support the integration of technology in our schools. Your accurate and honest feedback is essential! If you have any questions, please feel free to contact me at 245-7380. Thank you, in advance, for your time and participation.

Susan English
Director of Technology Courses, Aquinas College
Master in the Art of Teaching (M.A.T.) Candidate

*Please return this completed survey by **March 31**.*

APPENDIX D

Survey

Technology Survey

(Please complete and return by March 31st.)

Instructions....

- This survey should take less than 20 minutes to complete.
- You are encouraged to briefly read through the questions and reflect on them overnight before completing this survey so that responses are as accurate as possible. Feel free to add any anecdotal information in the margins of this survey that might better clarify your responses.
- The results of this diocesan supported study will be shared with your administrator and/or technology committee in order to improve the technology integration process.

(For the purpose of this survey "technology" refers to computer equipment and software, not other educational technology equipment such as VCRs and TVs -- unless they are being used in conjunction with computer equipment).

1. How would you rate your current level of computer expertise (as related to education)?
   - ☐ Advanced experience
   - ☐ Some experience
   - ☐ Very little experience
   - ☐ No experience

2. How would you rate your integration of computer technology into your classroom?
   - ☐ Regular Use (once/week)
   - ☐ Occasional Use (few times/month)
   - ☐ Very Minimal Use (few times/year)
   - ☐ Not used at all

3. Estimate how many hours of ***formal*** computer training you have received.
   (Count actual hours, not "credit hours.")
   - ☐ More than 20 hours
   - ☐ 11-20 hours
   - ☐ 5-10 hours
   - ☐ 0-4 hours

4. How many computers are available to you and your students in your classroom?
   - ☐ More than 5
   - ☐ 3-5
   - ☐ 1-2
   - ☐ None

5. How available is a computer lab for your use with your entire class?
   - ☐ Adequately available
   - ☐ Lab available has too few systems and/or can be difficult to schedule
   - ☐ Lab rarely available, inadequate setup
   - ☐ No lab available

6. Overall, how would you rate the computer software currently available to you?
   (Age Appropriate? Curriculum-related?)
   - ☐ Adequate
   - ☐ Somewhat inadequate
   - ☐ Totally inadequate
   - ☐ Don't know

7. How often does the availability of computers hinder your ability to use technology?
   - ☐ Frequently (once/week)
   - ☐ Occasionally (few times/month)
   - ☐ Rarely (once/year)
   - ☐ Never

8. How often do computer problems hinder your ability to use technology (at school)?
   - ☐ Frequently (once/week)
   - ☐ Occasionally (few times/month)
   - ☐ Rarely (once/year)
   - ☐ Never

9. When computer problems arise, how would you rate the technical support available?
   - ☐ More than adequate
   - ☐ Adequate
   - ☐ Somewhat inadequate
   - ☐ Totally inadequate

10. How would you rate the Internet connection available to you at school?
    - ☐ More than adequate
    - ☐ Adequate
    - ☐ Somewhat inadequate
    - ☐ Totally inadequate

11. How much time each WEEK(on the average) do your students use computers to complete any of the following tasks under your supervision (not with a "computer" teacher)?

3+ hrs	1-3 hrs	<1 hr/wk	Never	
☐	☐	☐	☐	Whole Class Activities
☐	☐	☐	☐	Small Group Projects
☐	☐	☐	☐	Individual/Indep. Work
☐	☐	☐	☐	Math drills
☐	☐	☐	☐	Spelling practice/drills
☐	☐	☐	☐	Typing reports, etc.
☐	☐	☐	☐	Presentations
☐	☐	☐	☐	Drawing/Art
☐	☐	☐	☐	Typing practice
☐	☐	☐	☐	Internet Research
☐	☐	☐	☐	Email
☐	☐	☐	☐	Simulations
☐	☐	☐	☐	Assessment/Testing
☐	☐	☐	☐	Problem-Solving
☐	☐	☐	☐	Games/Puzzles
☐	☐	☐	☐	Other:

12. How much time each WEEK(on the average) do you use computers to complete any of the following tasks?

3+ hrs	1-3 hrs	<1 hr/wk	Never	
☐	☐	☐	☐	Typing documents
☐	☐	☐	☐	Records/Grades
☐	☐	☐	☐	Internet Research
☐	☐	☐	☐	Trouble-shooting computer problems
☐	☐	☐	☐	Preparing tech. lessons
☐	☐	☐	☐	Email
☐	☐	☐	☐	Reading computer-related articles
☐	☐	☐	☐	System maintenance (e.g.; virus scans, backups, etc.)
☐	☐	☐	☐	Other:

13. How often do you and/or your students use computers in each of the following curriculum areas?

Frequently (almost daily)	Occasionally (monthly)	Rarely (once/twice/year)	Never	
☐	☐	☐	☐	Math
☐	☐	☐	☐	Science
☐	☐	☐	☐	Social Studies/History
☐	☐	☐	☐	Reading
☐	☐	☐	☐	Creative Writing
☐	☐	☐	☐	English/Lang. Arts
☐	☐	☐	☐	Religion
☐	☐	☐	☐	Foreign Language
☐	☐	☐	☐	Art
☐	☐	☐	☐	Music
☐	☐	☐	☐	Other:

14. How often do you or your students use each of the following kinds of software?

Frequently (almost daily)	Occasionally (monthly)	Rarely (once/twice/year)	Never	
☐	☐	☐	☐	Word Processing
☐	☐	☐	☐	Email
☐	☐	☐	☐	Internet Browsing
☐	☐	☐	☐	Encyclopedia CDs
☐	☐	☐	☐	Presentations
☐	☐	☐	☐	Spreadsheets
☐	☐	☐	☐	Databases
☐	☐	☐	☐	Drawing/Art
☐	☐	☐	☐	Topic/Unit Specific

15. How much time each WEEK do you spend using the computer for school-related tasks?
    - Please differentiate between school/paid time and personal time (eve./weekends).
    - Do NOT include time with students.
    - Do NOT include any formal training or paid in-service time.
    - DO include time spent on any of the tasks listed in question #12.

    DURING SCHOOL HOURS...

    _____ average # hours/week

    AFTER SCHOOL HOURS...

    _____ average # hours/week

16. How much time this past year have you spent during vacation time working on the computer on school-related tasks?
    - Do NOT include any formal training or paid in-service time.
    - DO include time spent on any of the tasks listed in question #12.

    DURING VACATIONS...

    _____ total # hours/year

17. In what ways does your school use computers to support special-needs students? (Check all that apply.)

    ☐ Not aware of any
    ☐ Dictation/Transcription
    ☐ Text Readers (for sight-impaired)
    ☐ Assessment/Testing
    ☐ Remedial Drill/Practice
    ☐ Other:

18. Which of the following subjects do ***you*** teach and which are taught by another instructor?

Taught by You	Other Instructor	Not Offered	
☐	☐	☐	Math
☐	☐	☐	Reading
☐	☐	☐	Social Studies/History
☐	☐	☐	English/Lang. Arts
☐	☐	☐	Science
☐	☐	☐	Writing
☐	☐	☐	Religion
☐	☐	☐	Music
☐	☐	☐	Gym
☐	☐	☐	Computers
☐	☐	☐	Foreign Language

19. In your opinion, what are the current needs at your school in terms of educational technology?

Currently Adequate	Improvement Needed	Critically Needed	
☐	☐	☐	Equipment Availability
☐	☐	☐	Newer Equipment
☐	☐	☐	Tech. Space/Facilities.
☐	☐	☐	Additional Software
☐	☐	☐	Formal Training (Staff)
☐	☐	☐	Tech. Support Availability
☐	☐	☐	Prep/Development Time
☐	☐	☐	School Technology Plan
☐	☐	☐	Other:

20. Any additional comments:

Remember, you are invited and encouraged to add any anecdotal information in the margins of this survey that might better clarify your responses. The more accurate your responses, the better we will be able to provide helpful and practical advice that supports your technology integration efforts.

***Thank you** again for your time and participation!*

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